

TECHNICAL MANUAL

QUALITY CONTROL
OF
PROPELLANT KEROSENE, RP-1
(ATOS)

Prepared By: Digital Data Support Group

This publication supersedes T.O. 42B7-2-1-2, dated 1 October 2001, which will be removed from active files.

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Original 0 15 July 2003

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INTRODUCTION

1. PURPOSE.

This technical manual is intended to cover the quality control procedures necessary to assure that rocket fuel, Specification MIL-P-25576, remains within specification limits from the time it is accepted at product supplier plant until it is used in the weapon system.

2. SCOPE.

This technical manual is intended to be used in conjunction with existing directives governing fuels operations, however, this technical order will take precedence where there is a conflict with other publications.

3. HAZARDS.

3.1 General. Information on the hazards associated with use and handling of RP-1 propellant kerosene and other hydrocarbon fuels can be found in AFOSH STDS 48-8, 48-22, and 91-38.

3.2 Fire Hazards. RP-1 has a minimum flash point of 110°F. Fuel vapors will form explosive mixtures with air within the limits of approximately 1.16 to 6% by volume of RP-1 vapor in air. These limits may be reached within the temperature ranges of 110° to 220°F. The explosive RP-1 fuel/air mixture, if formed, may be exploded by an electric spark or open flames.

3.3 Precautions. NO SMOKING regulations will be adhered to at all times. All facilities, trailers, storage tanks, and fuel filtering and dewatering units will be grounded and bonded during all fuel transfer operations.

4. SAFETY.

4.1 Definition.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

4.2 General Precautions. The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this technical manual. These are general safety precautions and instructions that people must understand and apply during many phases of operation and maintenance to ensure personal safety and health, and the protection of Air Force property.

- a. Finger Rings/Jewelry – finger rings have caused many serious injuries. Remove rings, watches, and other metallic objects, which may cause shock or burn hazards. Unless specifically allowed by shop safety procedures, remove finger rings during all maintenance activity.
- b. Dangerous Pressure – care must be taken during testing to ensure that all test connections are proper and tight. All system components must be compatible with pressure applied. Personnel must be protected by a safety shield or located at a distance sufficient to prevent injury.
- c. Personal Protective Equipment (PPE) – if unique local conditions make compliance with the protective clothing or other occupational health requirements specified in this manual unnecessary or impractical, obtain an evaluation of the operation from the Bio-Environmental Engineer. The Bio-Environmental Engineer and Base Safety Office will determine the required precautions.
- d. Cleaners/Chemicals – some cleaners and chemicals have adverse effects on skin, eyes, and the respiratory tract. Observe manufacturers' WARNING labels; Material Safety Data Sheets (MSDS) for proper handling, storage, and disposal; and current safety directives. Use only in authorized areas. Unless otherwise indicated in the text, use as described in this T.O. should not result in any immediate health concerns. Consult the local Bio-Environmental Engineer and Base Safety Office for specific protection equipment and ventilation requirements.
- e. Confined Space/Crawlspaces – personnel that work within an aircraft space(s) that: by design has limited openings for entry and exit, has unfavorable natural ventilation, not intended primarily for human occupancy, or contains other recognized safety hazards shall comply with the requirements of AFOSH STD 127-25, CONFINED SPACES. An AF Form 1024, CONFINED SPACES ENTRY PERMIT will be processed with the local Safety, Health, and Fire Prevention offices prior to entering the space.

CHAPTER 1

GENERAL INFORMATION

1.1 PROPERTIES.

RP-1 is a high boiling kerosene fraction, ranging in color from water white to pale yellow when blended at the refinery. When delivered to the field it is red, due to the

addition of a 4-diazo-2-naphthol dye. RP-1 consists of hydrocarbons and approved additives to impart desired properties. RP-1 is a stable clear liquid with a specific gravity of 0.799 to 0.815. RP-1 has a minimum flash point of 110°F.

CHAPTER 2

TRANSPORTATION, PACKAGING, AND STORAGE

2.1 METHODS OF TRANSPORTATION.

RP-1 will normally be delivered from the supplier to the using site by tank car, tank truck, or 55-gallon drums and transferred to the base ready storage system.

2.1.1 Tank Cars. The following railroad tank cars are approved for transportation of RP-1: DOT Classes 103, 104, 105, 109, 111, 112, 114, 115, or 120 tank car tanks. These cars are equipped with either top or bottom outlets. However, to implement off-loading, care must be taken to use only cars equipped with bottom outlets. These specifications cover steel and steel alloy tanks.

2.1.2 Tank Trucks. The following motor tank trucks are approved for transportation of RP-1: MC-300 and MC-302 through MC-307. These specifications cover open hearth or blue annealed steel, welded aluminum (3S, 52S), and welded high-tensile steel.

2.1.3 55-Gallon Drums. Types 1 - (DOT 5B) Class A, steel drums, in accordance with PPP-D-729, are required for drum shipments of RP-1.

2.1.4 Laboratory Samples. Normally a one-gallon size sample of RP-1 is suitable for performing specification tests. The preferred sample container for RP-1 is a one-gallon capacity steel can conforming to DOT 17C with epoxy phenolic lining, screw cap and seal, NSN 8110-01-371-8315. An overpack is not required for transportation of the DOT 17C container.

NOTE

Polyethylene bottles or jugs are not to be used as sample containers.

2.2 TANK TRUCK, TANK CAR LINING.

Mild steel tanks for use in the transportation and storage of RP-1 shall be coated with a material approved under Specification MIL-PRF-4556.

CHAPTER 3

RECEIPT

3.1 CERTIFICATE OF ANALYSIS.

A copy of the certificate of analysis required by Specification MIL-P-25576 will be furnished to the receiving agency on each shipment of RP-1, with the shipping document.

3.2 EXAMINATION UPON RECEIPT.

Examine each receipt in accordance with applicable paragraphs in T.O. 42B-1-1. The fuel is considered dry if there are no visible water droplets. Upon satisfactory completion of the required checks, the RP-1 will be discharged

directly into the on-base storage tank or fuel servicing vehicles. All fuel off-loaded to a missile site by a commercial/military vehicle must pass through a filter separator. If the required examination indicates the presence of dirt or water, the fuel will not be off-loaded and the appropriate government representative at the contractor's plant will be contacted for resolution of the problem. A one-gallon representative sample of questionable RP-1 will be forwarded to the appropriate area laboratory for complete analysis. Area laboratories are listed in T.O. 42B-1-1.

CHAPTER 4 STORAGE

4.1 GENERAL.

RP-1 is a stable fuel with a minimum storage life of two and one-half years under average conditions. MIL-HDBK-201 will be complied with for storage of drummed stocks. Sampling and testing as specified herein, will assure satisfactory performance of the fuel at time of use.

4.2 QUALITY CONTROL PROCEDURES FOR PROPELLANT KEROSENE (RP-1) AT BASE LEVEL.

Sampling of RP-1 will be performed in accordance with T.O. 42B-1-1 and as required by individual test methods.

4.3 VISUAL INSPECTION PROCEDURE.

- a. Use a clean, clear glass bottle. Clean the sample bottles with soap; rinse with hot water; rinse with distilled or demineralized water; then oven or air-dry in a dust- and lint-free atmosphere.
- b. Check for red color and all forms of visual contamination by swirling the sample so that a vortex is formed. All sediment or water that has settled will accumulate on the bottom of the bottle directly beneath the vortex. Experience will dictate what can be considered excessive sediment. Very fine suspended solids or water will render the product hazy. If the examination is questionable, a laboratory analysis will be made to verify the quantity of contaminant.

4.4 TOTAL SOLIDS.

Solid contamination testing will be performed in accordance with T.O. 42B-1-1. Total solids will not exceed 5.7 mg/gal.

4.5 WATER CONTENT OF FUEL.

Water content shall be determined in accordance with T.O. 42B-1-1. Water content will not exceed 20 ppm.

4.6 PRODUCT ON-BASE.

RP-1 will be tested for sediment and water as follows:

Sampling	Frequency
Bulk Holding Tank	Each time the tank has been replenished or every 30 days prior to servicing.
Drummed Stock	Prior to addition to the bulk holding tank.
Down Stream of the Filtering and Dewatering Unit	Every seven days or during each use if unit is not used on a 7-day frequency.

4.7 API GRAVITY.

This test will be performed every 30 days, after servicing, and when contamination is suspected from other hydrocarbons. API gravity will be within military Specification MIL-P-25576 limits.

4.8 API GRAVITY TEST METHOD.

To determine API gravity, use procedures in T.O. 42B-1-1.

- a. To correct the observed API gravity of RP-1 to API gravity at 60°F (16°C), use ASTM D1250, Volume II, Table 5B. Record the observed API gravity/temperature and corrected API gravity at 60°F (16°C).
- b. To correct measured volume of RP-1 to 60°F (16°C) net volume, use ASTM D1250, Volume II, Table 6B.

4.9 ON-BASE STORAGE AND FUEL SERVICING TRAILER QUALITY CONTROL PROCEDURES.

On-base storage tanks and fuel servicing trailers will be sampled every 30 days. The sample will be visually examined for free water and then tested in the on-base laboratory for water content and total solids. Every third sampling period, 90 days, a one-gallon sample will be drawn and forwarded to the area laboratory for complete specification analysis. RP-1 will be considered acceptable for use as long as chemical and physical requirements conform to Specification MIL-P-25576.

4.10 ATLAS QUALITY CONTROL PROCEDURES.

4.11 MISSILE FUEL TANK.

A one-gallon sample will be taken from the APEX drain every 90 days and/or prior to removing the missile from the silo. The sample will be obtained by connecting approximately 12-feet of dry polyethylene tubing to the drain valve fitting to avoid spilling of RP-1 on the missile. The drain valve must be opened slowly to insure that no free water near the sampling point will be by-passed by the fuel. Each sample will be visually examined for free water and forwarded to the area laboratory for complete analysis. The base will request that the projected shelf life of the product be determined and entered on the report of analysis. In addition, the analysis will indicate total water content in PPM. If the visual examination reveals the presence of free water, the RP-1 must be recirculated through the FPU until all free water is removed.

4.12 FUEL LEVELING TANK.

A one-gallon sample will be taken from the F-6 valve every 90 days. This sample will be visually examined for free water and forwarded to the on-base laboratory for water

content and total solid testing. The RP-1 will be circulated through the FPU at least every 180 days. Prior to commencing fuel circulation, a one-gallon sample will be taken from APEX drain. During recirculation, samples will be taken from the site gage of the FPU. Recirculation will continue for 2 hours and/or until the RP-1 contains no visible free water or suspended matter.

4.13 USE LIMITS.

Use limits for Atlas are specification limits, total water content less than saturation limit, and 5.7 mg/gal total solids. An on-site visual examination will be made for free water and/or suspended matter. The total water content will be taken from the moisture gauge on the FPU. Total solids will be determined by the on-base laboratory. Area laboratories will conduct specification tests, total water, and total solid analysis. Particle size will not exceed 1000 microns; fibers will not exceed 6000 microns.

4.14 REQUIRED ACTIONS.

- a. RP-1 which contains water and/or total solids in excess of 5.7 mg/gal will be circulated through a filter-separator until the water is removed and solids have decreased. Filter-separator elements will be replaced as necessary.
- b. RP-1 which does not meet specification requirements after area laboratory testing will be disposed of as directed by Det 3, WR-ALC/AFTH, DSN 785-8070.